Initiating Development:
An Evaluation of State Brownfield
Redevelopment Policies and Initiatives

An Honors Thesis (HONRS 499)

By

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Ball State University
Muncie, IN

April, 2006

Expected Date of Graduation: Saturday, May 6, 2006

Abstract

In response to the 1980 Comprehensive Response, Compensation, and Liability Act, states have taken measures to enact their own environmental clean-up policies and initiatives. Previous studies have analyzed different variables leading states to adopt such programs. This study continues this research, providing a comprehensive review of literature and testing hypotheses concerning the relationships between state population, EPA region, fiscal expenditures/revenues, and effort/investment, and using data collected by the Environmental Law Institute (2001), this paper uses multivariate regressions to analyze three models. Similar to previous work, this paper finds population, fiscal resources, and pollution severity as major factors affecting states' adoption of brownfield redevelopment programs.

Acknowledgements

Thank you, Dr. Joseph Losco for serving as my mentor through this project and through out my undergraduate career.

Thank you, Dr. Misa Nishikawa for editing my first draft.

Many, many thanks to my family and friends for their constant love and support!

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Introduction

The 2001 Brownfields Revitalization and Environmental Restoration Act defines a brownfield as "real property the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" (Bergeson, 2002: 2). According to Hula (2001: 4), current "brownfield programs reflect an attack on fundamental assumptions...of American toxic waste policy." Originally dominated by the federal government, the states have progressively become more involved in ensuring that these sites, are not only cleaned, but also redeveloped into economically usable properties. For example, states have begun voluntary programs, making use incentives to encourage private developers to take on different projects. As a result, the private sector has taken a leadership role in brownfield programs, allowing economic development to become a primary goal.

Certain characteristics of states are associated with the adoption of brownfield redevelopment programs. Lester and Lombard (1990) in a comprehensive study of environmental protection policies identified several state characteristics associated with more extensive clean-up/redevelopment programs. Their model proposed four variables (severity, wealth, partisanship, organizational), which influenced a states' decision to enact these programs. Based on a further evaluation of relevant literature that test Lester and Lombard's (1990) proposals, I hypothesize that population size, region, federal grants, and pollution severity create states' capacity and desire to enact brownfield redevelopment programs.

Using the Environmental Law Institute's *An Analysis of State Superfund Programs: 50 –State Study, 2000 Update*, this paper tests the proposition that state success and staffing of brownfield/voluntary programs are related to a state's (1) population size, (2) region, (3) fiscal expenditures and revenues, and (4) the severity of site pollution.

Literature Review

This review examines literature on American environmental policy and programs dealing with brownfield redevelopment. It begins by placing redevelopment policies in a historical context, providing background information about federal and state roles in the process. This is followed by a discussion of a theoretical framework to identify specific state characteristics that lead to adoption of brownfield redevelopment programs.

The 1980 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), enacted by Congress in 1980, served as an early model of environmental redevelopment policy. According to Hula (2000: 2), in order to understand CERCLA, one must take into account "its strong commitment to...restoring sites to a natural condition and imposing cleanup costs on those responsible for the site pollution." CERCLA sought this goal through two mechanisms: (1) total liability placed upon those found to be responsible for a site's contamination (Hula, 2001). (2) CERCLA stipulates the chief goal for the federal government, under the Environmental Protection Agency (EPA), should is cleaning contaminated sites. According to Copeland (1997: 2) "when

[CERCLA] was enacted in 1980, [the policy] gave the federal government the lead role." Through a firm and centralized policy, the EPA used CERCLA to implement a rigorous policy aimed at cleaning contaminated sites.

States Contend For Authority

Even though CERCLA named the federal government as the leader in site rehabilitation for the nation's most contaminated sites, state governments also created redevelopment programs to deal with less dangerous sites. CERCLA and the 1986 Superfund Amendments and Reauthorization Act (SARA) require the EPA to confer with states concerning clean up efforts. However, states could begin their own cleanup programs only with a Memoranda of Agreement with the EPA. In any case, the EPA still remains in the leading role (Copeland, 1997). According to Hula (2001: 23) , "typically, state participation demands extensive negotiation between state authorities and the EPA." CERCLA reserved America's "worst toxic sites for federal action," and these sites are placed on the National Priority List (NPL) (Hula, 2001: 3). However, it is important to note that there are only 1,300 sites, nationally, that have met the criteria to be placed on the NPL (Copeland, 1997). The remaining 30,000 contaminated sites "that do not present enough of a risk to be cleaned up under the federal program" have been left to states' discretion (Copeland, 1997: 3). States have assumed a leading role in cleaning these less polluted sites. Furthermore, there are 117 state funds specifically dedicated to these "non-NPL" sites (Environmental Law Institute, 2001). For that reason, even though CERCLA established a dominant role for the EPA, states have begun to create alternative policies.

Recently, the federal government has begun to encourage states to assume a leading role in site cleanup. On January 11, 2002, President G. W. Bush signed the Small Business Liability Relief and Brownfields Revitalization Act, which "provides relief from liability under CERCLA...[and] authorizes increased funding for state and local programs that assess and clean up brownfields"(Bergeson, 2003: 3). Funds to clean brownfields doubled from $98 million in the 2002 fiscal year to $200 million in the 2003 fiscal year. As recently as May 2005, the EPA distributed $75.9 million in brownfield redevelopment grants to state programs (Crowley, 2005: 2). The federal government is clearly promoting the decentralization of environmental authority.

Voluntary Cleanup Programs

States have begun to successfully employ voluntary programs to facilitate site cleanups. According to the Environmental Law Institute, by 2000, 49 states made use of formal voluntary cleanup programs. States note the progress that their programs have made relative to CERCLA. For example, 270 state sites in New York and 200 sites in Illinois have been cleaned, compared to 16 and 5 NPL sites in those respectively (Copeland, 1997: 4). Furthermore, Copeland (1997: 2) asserts that states have taken leadership of 10% of NPL clean-ups.

State success is attributed to the benefits offered to developers and other participants. Benefits include "less complex administrative organization, partial liability relied relief from cleanup liability[less rigid that CERCLA] and economic subsidies for developers," quenching the fear of future law suits (Hula, 2001: 23). Furthermore, many states have redefined standards for completing site clean-ups. For example, the Michigan

Department of Environmental Quality employs separate standards for residential, commercial, and industrial sites. In addition, "the cleanup levels for known carcinogens...[and] groundwater cleanup standards have been revised to...less stringent levels" (Hula, 2001: 9). Through these voluntary programs, states are able to cooperate with developers and other private parties, facilitating site clean-up.

Economic Redevelopment of Brownfields

The goal of CERCLA and earlier clean-up programs rested solely on site clean-up. However, more recent programs have stresses economic development. Brownfields are classified as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant" (Wagner, 2004: 2). The goal of redevelopment seems implied by this definition. According to Hula (2001: 5), brownfield programs "stress the need to identify the planned use of the property after the clean-up is complete." It is not surprising that economic redevelopment and the opportunities have become a primary focus of state voluntary programs. Participation in brownfield redevelopment by these private developers is "not based on any appeal to civic obligation...but simply that brownfields are sound business investments" (Hula, 2001:18). Furthermore, Howland (2003: 1) suggests that "when market conditions are strong, contamination relatively minor...the private sector is more likely to be the sole initiator and implementer of redevelopment. Indeed, privately led brownfield redevelopment programs have become viable options for states.

As a result of private interests in brownfield redevelopment, states are grappling with the task of balancing developers' economic interests with public participation and preferences. "Developers and local officials often argue that significant requirements for public participation can often slow...kill specific site initiatives, " because community members are not aware of economic conditions and restrictions (Hula, 2000: 11). Hula's study goes on to present that 13 states do not require any sort of public participation. On the other hand, "if local residents are not engaged in the planning process, fatal opposition to the project is likely to develop later [on]" (Hula, 2000: 11). States use different methods to maintain community involvement, ranging from public hearings to advisory boards. Wagner (2004: 8) presents an interview with a brownfields developer who states that "public/private partnerships...understand[ing] each other's strengths and limitations...support[ing] each other...[has] helped even the more difficult projects to come to fruition." Even though communities and private developers have different perspectives concerning brownfield development, cooperation between the two parties can yield positive benefits.

Theoretical Framework

To identify specific state characteristics leading to adoption of brownfield redevelopment programs, it is important to review similar studies.

Lester and Lombard (1990) present a comparative analysis, in which they propose four factors that influence a state's implementation of what they call environmental protection policies and programs. These include:

1. The **severity** argument essentially proposes that "public consumption of goods...create severe pollution problems which...bring about strong pressures for...protection policies" (Lester and Lombard, 1990: 308). In states where pollution is higher, the demand for public action should increase.
2. The **wealth** argument simply argues that states with larger "fiscal resources" have the monetary ability to create environmental protection programs (Lester and Lombard, 1990: 308).
3. The **partisanship** argument uses political affiliation to explain which states will utilize these policies. "Democrats [are] more supportive of [environmental] efforts than Republicans," which can be attributed to voting patterns in state and federal legislatures (Lester and Lombard, 1990: 309).
4. The **organizational** capacity argument claims that "centralization of the environmental bureaucracy promotes environmental protection policy" because this arrangement reduces conflict and overlap that occurs when multiple agencies are involved (Lester and Lombard, 1990: 309).

Lester and Lombard's argument was tested in a study conducted by Bacot and Dawes (1997). Bacot and Dawes (1997: 355) explore "the dynamics surrounding the adoption and implementation of state policies," resulting in two proposed models:

1. The **expenditure** model investigates the relationship between a state's "financial capacity to manage [brownfield redevelopment] programs." This is operationalized as a state's fiscal health—"the ratio of total state revenue minus total state spending." States with a higher fiscal health are more likely to engage in these programs. However, Bacot and Dawes (1997: 356)

recognize that "state expenditure decisions represent the budget preferences of state legislators." Political agenda setting plays a role in the enactment of state programs, therefore, even though a state may have the expenditures to facilitate brownfield redevelopment, political influences may result in other programs taking priority.

2. The **ranking** model explores the strength of a state's "total programmatic effort" (Bacot and Dawes, 1997: 356). Beyond funding, agencies and institutions must be in place to enforce these environmental policies. This concept is operationalized based upon the primary state agency charges with managing environmental programs. Based upon Lester and Lombard's (1990) work, Bacot and Dawes (1997: 357) propose that a state with a "single agency" is more efficient than a "superagency" because administrative efforts are not divided.

Bacot and Dawes (1997: 360) measure the empirical link between (1) state fiscal health, (2) pollution severity, (3) "political capacity to support environmental legislation" (i.e. political affiliation), (4) strength of the state's environmental group membership (Sierra Club), (5) region (Southern states vs. non-Southern states), and (6) state population. Regression models find that pollution severity, population, environmental group strength, and region were statistically significant. In fact, both models find "population and pollution [to be] the overriding factors paramount to understanding state's environmental plights" (Bacot and Dawes, 1997: 360). However, these studies do not account for the influence that federal policies and funding have on state programs. "For example, innovative federal legislation stimulates state governments to take similar action," as

shown by state adoption of environmental clean-up programs modeled after CERCLA (Lester and Lombard, 1990: 312). Furthermore, Hula (2003: 21) found that states located in EPA Region 5 "on average, show a higher degree of innovation" in brownfield redevelopment, a majority of these states located in the "rust belt" (former industrial powerhouses).

Using these two studies, and on the basis of previous literature this paper proposes three hypotheses:

H_1:

Number of completed, redeveloped sites (in each state) = $a + b_1$ (state population) + b_2 (EPA region) + b_3 (fiscal) + b_4 (pollution severity),

where the number of completed sites is dependent on state population, EPA region, fiscal income/spending, and pollution severity.

H_2:

Ratio of completed clean-ups to number of National Priorities List (NPL) sites = $a + b_1$ (state population) + b_2 (EPA region) + b_3 (fiscal),

where a ratio between redeveloped sites and NPL sites is created and is further dependent on state population, EPA region, fiscal income/spending, and pollution severity.

H_3:

Effort and Investment = $a + b_1$ (state population) + b_2 (EPA region) + b_3 (fiscal) + b_4 (pollution severity),

where a state's effort and investment contributed to brownfield redevelopment is dependent on population, region, fiscal income/spending, and pollution severity.

Data and Methods

This section outlines the design and methodology to be used to test a set of hypotheses relating characteristics of states to brownfield programs. This section includes a brief discussion of the sources of the data, the conceptualization and operationalization of variables, and the statistical techniques used.

An Analysis of State Superfund Programs: 50 –State Study, 2000 Update

As mandated by the 1986 Superfund Amendments and Reauthorization Act (SARA), the EPA's State, Tribal, and Site Identification Center collects data concerning state environmental programs for the purpose of providing guidelines and suggestions for improvement. The Environmental Law Institute Center for State Local and Regional Environmental Programs has collected data on state level cleanups. Initially conducted in 1989, this report was updated in 1990, 1991, 1993, 1995, 1998, and in 2000.

The Environmental Law Institute's (ELI) *An Analysis of State Superfund Programs: 50 –State Study, 2000 Update* includes an examination of all 50 U.S. states, Washington D.C., Puerto Rico, and full descriptions of each entity's statues, programs, staffing/funding, expenditures, standards, and activities. ELI collected this data through telephone interviews from state environmental program staff. ELI also conducted an analysis of "state documents, legislative reporting services, newsletters, state websites, and EPA documents" (Environmental Law Institute, 2001: 1). It is important to note that this data is based only on information on/before 2000 fiscal year (June 30, 2001). Furthermore, this study only discusses non-NPL (National Priority List) sites. ELI (2001: 21) acknowledges that "differences in state programs…limit[s] the comparability of

programs;" however, for the purpose of this paper, the data provided is more than sufficient.

Brownfield Redevelopment as a Dependent Variable

Each model utilizes some measurement of a state's support for brownfield redevelopment policies and initiatives as a dependent variable. According to Hula (2000: 10), "commitment of public officials to the goals of formal policy" is a factor contributing to the outcome of brownfield redevelopment programs and initiatives. Furthermore, Hula (2000: 10) acknowledges that "the notion of commitment [support] is itself complex." Therefore, in accordance with the literature, each model conceptualizes different facets of measuring state support.

The reported number of completed, redeveloped sites is a dependent variable in the model. The Environmental Law Institute provides data that accounts for the number of sites that have been completely cleaned since the start of each state's voluntary cleanup program. This model hypothesizes that the more support and resources a state provides to its program, the greater the sites cleaned. As opposed to simply measuring the number of sites completed in the 2000 fiscal year alone, this variable provides a comprehensive analysis of state support and state rates of completion over an extended period of time. For example, while New Jersey reports the completion of the most site clean-ups are 3,500 sites, South Dakota, Wyoming, and Louisiana have reported that 0 (zero) sites have been completed. However, the ELI (2001) does acknowledge a variation in numbers of reported sites completed may be result of the fact that some programs were only recently established. It is also important to note that 12 states (Puerto Rico, Washington D.C., West Virginia, Florida, Georgia, Kentucky, Michigan, Arkansas,

Kansas, North Dakota, Nevada, and Idaho) do not report the number of completed sites within their respective jurisdictions.

Model 2 creates a ratio between the number of state clean-ups and the number of National Priority List (NPL) sites reported within the state. The ELI (2001) reports an estimated 1200 sites as NPL sites. The ratio between these two measures estimates number of clean-ups relative to overall levels of pollution. The number of NPL sites within a state is also an independent variable, and will be discussed in greater detail below.

Model 3 accounts for the state effort and investment to the brownfield redevelopment effort. Resources provided to redevelopment programs measure state support. In this case, a "resource" is operationalized as staff and government personnel who participate in the volunteer clean-up programs. The ELI (2001) recognizes that program organization varies among states; however 47 states reported information concerning staffing of their clean-up programs (West Virginia, Puerto Rico, Kansas, Idaho, and Washington D.C. did not report their number of staff). Furthermore, numbers of staff contributed to redevelopment programs vary from 555 in New Jersey to 3.5 reported in South Dakota. Again, the ELI accounts for these variations as a result of funding or the early stages of some of the volunteer programs. This model also presents a ratio between the state population and staff. This ratio accounts for the population differences between states. For example, a less populated state may contribute a smaller absolute number of staff to their voluntary programs; however the percentage in relationship to the population could be larger than a more populated state. Specifically,

this dependent variable measures the number of staff per 100,000 people (state population).[1]

Independent Variables

Each model will be tested using four individual, independent variables: state population, Environmental Protection Agency (EPA) region, fiscal revenues/ expenditures, and pollution severity.

According to Bacot & Dawes (1997: 358), state population "contributes explanatory power...by estimating the effects of size disparities on environmental effort across states." Furthermore, in their severity argument, Lester and Lombard (1990: 308) suggest "rapid and concentrated population growth...[along with] steady rates of public consumption...create severe pollution problems." Thus, state population as an independent variable serves a dual role: first, to account for the influence that citizens, numerically, have on creation and execution of environmental policies. Second, population accounts for a relationship between mass consumption and pollution severity levels. In this model, state population data are provided through the *State and Metropolitan Area Data Book* (2000).

Hula (2000) discusses the influence that Environmental Protection Agency (EPA) region has on environmental protection plans and initiatives. Using a series of t-tests, Hula (2000) finds that there are significant differences which pinpoint EPA region 5 as more "innovative" leaders in brownfield redevelopment programs. In this model, EPA region serves as an indicator of geographic factors that influence support of brownfield redevelopment. Furthermore, the ELI (2001) provides data concerning each state's EPA

region, ranging from Region 1 to Region 10. According to Hula's (2000) findings, Region 5 includes Michigan, Illinois, Indiana, Minnesota, Ohio, and Wisconsin, which suggest that geographic proximity, and perhaps a shared political/regional culture, influence support for environmental redevelopment.

Fiscal variables account for the impact that financial resources have on a state's capacity and willingness to support brownfield redevelopment. This model uses 3 indicators of financial wellbeing:

1. The amount of federal grants received accounts for the success and effectiveness of national intervention in state initiatives. Lester and Lombard (1990: 312) discuss how "federal activities in the environmental area have been a major influence on state environmental programs," including the effect of federal aid on state spending. Therefore, my model attempts to fill this gap by testing whether there is a significant relationship between the dollar amount of grants received from the federal government, and a state's likelihood of supporting environmental programs. Data concerning the dollar amount of federal grants received by each state is provided through the EPA's *Brownfields Grants Fact Sheet* (2000).
2. The size of each state's clean-up fund, the amount of money allocated for redevelopment and clean-up programs also indicates each state's capacity and willingness to promote environmental initiatives. The ELI (2001) reports the balance in each state's fund at the end of the 2000 fiscal year. Nine states (Arkansas, Washington D.C., Kansas,

Nevada, Ohio, Puerto Rico, Rhode Island, West Virginia, and Wyoming) did not provide information concerning the state fund; however, ELI (2001) totaled the amount of state funds for environmental redevelopment programs at $1.24 billion.

3. Tax revenues indicate each state's actual financial resources and their ability to realistically contribute to their brownfield redevelopment programs. Both Lester and Lombard (1990) and Bacot & Dawes (1997: 3) account for financial health in their arguments, hypothesizing that "a state's current fiscal health displays its ability to fund certain programs." This data will also be provided through the *State and Area Metropolitan Data Book* (2000).[2]

The final independent variable, pollution severity, tests whether a state's propensity to support environmental clean-ups is associated with overall levels of pollution. Lester and Lombard (1990: 308) suggest "severe pollution problems...in turn, bring about strong pressures for environmental protection policies." In this model, measuring the number of National Priority List sites within each state operationalizes pollution severity. According to Hula (2000: 14), "the National Priority List is comprised of the nation's most seriously contaminated sites." These sites are reserved for federal action; however they are an accurate indicator of the severity of pollution within the individual states. The ELI provides a list of approximately 1200 NPL sites, varying from 0 (zero) in North Dakota to 111 sites in New Jersey. Using each state's number of NPL sites as an indicator of pollution severity provides a uniform standard of measurement while acknowledging the variance among states.

Proposed Models

Revised model are presented below:

Model 1: Completed sites = a + b_1 (Population) + b_2 (EPA region) + b_3 (federal grants) + b_4 (Clean-up fund) + b_5 (tax revenues) + b_6 (NPL sites)

Model 2: Clean-ups/NPL sites = a + b_1 (Population) + b_2 (EPA region) + b_3 (federal grants) + b_4 (Clean-up fund) + b_5 (tax revenues)

Model 3a: Staff = a + b_1 (Population) + b_2 (EPA region) + b_3 (federal grants) + b_4 (Clean-up fund) + b_5 (tax revenues) + b_6 (NPL sites)

Model 3b: Staff/Population * 100, 000 = a + b_1 (EPA region) + b_2 (federal grants) + b_3 (Clean-up fund) + b_4 (tax revenues) + b_5 (NPL sites).

Analysis and Results

The paper tests three models to investigate the relationship between state adoption of brownfield redevelopment programs and state (1) population, (2) EPA region, (3) fiscal expenditures and revenues, (4) pollution severity:

Model 1: Completed sites = a + b_1 (Population) + b_2 (EPA region) + b_3 (federal grants) + b_4 (Clean-up fund) + b_5 (tax revenues) + b_6 (NPL sites)

Model 2: Clean-ups/NPL sites = a + b_1 (Population) + b_2 (EPA region) + b_3 (federal grants) + b_4 (Clean-up fund) + b_5 (tax revenues)

Model 3a: Staff = a + b_1 (Population) + b_2 (EPA region) + b_3 (federal grants) + b_4 (Clean-up fund) + b_5 (tax revenues) + b_6 (NPL sites)

Model 3b: Staff/Population * 100, 000 = a + b_1 (EPA region) + b_2 (federal grants) + b_3 (Clean-up fund) + b_4 (tax revenues) + b_5 (NPL sites)

I hypothesize that each dependent variable (number of clean-ups completed, clean-ups/NPL sites, staff, and staff/population), is positively related to the independent variables because previous literature and studies indicate that states with bigger populations, with larger fiscal resources, and also higher pollution severity are likely to have more success and staff for their brownfield redevelopment programs.

Model 1[3]

Analysis of Model 1, using the standardized coefficients,[4] yields the following equation:

Completed sites = 455.875 + 0.037 (Population) – 0.121 (EPA region) + 0.098 (federal grants) + 0.020 (Clean-up fund) + 0.101 (tax revenues) – 0.077 (NPL sites).

No coefficient is significant at the 0.05 level. Furthermore, according to the coefficient of determination (0.046), this model accounts for only 4.6% of variance within the cases. None of the independent variables, population (P-Value = 0.950), EPA region (P-Value =

0.672), federal grants (P-Value = 0.683), clean-up fund (P-Value = 0.946), tax revenues (P-Value = 0.854), and NPL sites (P-Value = 0.787) meet the 95% confidence level. These results indicate no association between the number of completed sites and state population, EPA region, federal grants received, size of clean-up fund, tax revenues, and NPL sites.

Model 2

The second regression model produced the following equation:

Clean-ups/NPL sites = 45.531 - 0.100 (Population) – 0.239 (EPA region) + 0.147 (federal grants) + 0.048 (Clean-up fund) + 0.215 (tax revenues) - 0.270.

Again, this model had no significant coefficients. In this case, the coefficient of determination (0.126) accounts for 12.6% of variation within the cases. No variable meets the 95% confidence level. No association between clean-ups per NPL sites and the independent variables were found.

Model 3a:

Model 3a produced the following equation:

Model 3a: Staff = -12.808 + 0.507 (Population) + 0.055 (EPA region) + 0.156 (federal grants) + 0.721 (Clean-up fund) – 0.303 (tax revenues) + 0.007 (NPL sites).

In this model, two variables, population (P-Value = 0.027) and clean-up fund (P-Value = 0.000) meet the 95% confidence level. The remaining variables, EPA region (P-Value =

0.592), federal grants (P-Value = 0.103, tax revenues (P-Value = 0.152, and NPL sites (P-Value = 0.948) are not significant at the 0.05 level. These results indicate a positive relationship between state staffing levels and the state population, where the bigger the population, more staff is apportioned to conduct the various state programs. There is also a significant, positive relationship between staffing and the size of the state funds allotted to environmental clean-up, and brownfield redevelopment. States also designate more staff to programming and other initiatives. Therefore, both population and fund size influence this measurement of state effort.

I also tested this model without the two significant variables: (1) without population and (2) without the clean-up fund variable.[5]

1. This regression (conducted without the population variable) continued to find the fund variable significant (P-Value = 0.000). This strengthens the independent relationship between clean-up fund and staffing levels. Interestingly, federal grants (P-Value = 0.048) is also significant in this model. This suggests one reason that, though population predicts clean-up activity, it is correlated to federal grant funding.
2. Testing this model without the fund variable has similar results. The significance of the population variable is strengthened (P-Value = 0.003) and remains positive. However, tax revenues become negative and significant (P-Value = 0.037). This result suggests an increased effort by states with smaller revenues to employ brownfield redevelopment program.

Model 3b

Testing this model provided the following results:

Model 3b: Staff/Population * 100,000 = 1.533 - 0.144 (EPA region) - 0.060 (federal grants) + 0.647 (Clean-up fund) - 0.257 (tax revenues) + 0.271 (NPL sites).

This model also yielded three significant coefficients: clean-up fund (P-Value = 0.000), tax revenues (P-Value = 0.032) and NPL sites (P-Value = 0.039). The remaining variables, EPA region (P-Value = 0.213) and federal grants (P-Value = 0.598 did not meet the 95% confidence level. Not surprisingly, the magnitude of state clean-up funds is positively related to per capita staffing. Tax revenues are negatively related to staff/population. This presents a counter-intuitive finding that states with smaller revenues allocate more staff to brownfield redevelopment programs. In this model, we observe pollution severity, indicated by NPL sites, is positively associated with per capita staffing levels.[6]

Discussion

Research Summary

This paper sought to identify different independent variables that predict aspects of state success and investment in brownfield redevelopment initiatives. The number of sites completed and a ratio between sites completed and the NPL sites served as a measurement of state success in the brownfield redevelopment programs. Additionally, state effort and investment in brownfield clean-up was measured through staff and staff/100,000 population. The paper hypothesized the relationship between a state's population, EPA region, fiscal revenues/expenditures, and pollution severity and the

likelihood that the given state would adopt and staff the redevelopment programs. An analysis of three separate models revealed that the number of completed sites and clean-ups/NPL sites is not a significant measure of state program success. However, using the set of effort and investment variables (staffing and staff/100,000 population), my models found state population, revenues/expenditures, and pollution severity to be significant factors leading states to staff their brownfield redevelopment programs.

Staff has a strong, positive association with both population and the size of the state fund allocated to redevelopment programs. States with a larger population are more likely to have higher levels of staffing to implement brownfield redevelopment programs. According to Lester and Lombard (1990: 308), this relationship could be a result of severity, where states with bigger populations yield higher "rates of public consumption [to] bring about pressures for environmental protection policies." States that have dedicated larger funds to the redevelopment programs also are more likely to have a higher staffing level. However, when assessing the model without the fund variable, tax revenues becomes negatively significant. According to Lester and Lombard (1990: 308), "states with greater fiscal resources spend more on environmental protection;" however my model suggests that states with smaller revenues dedicate more staff to their programs. This depicts an interesting relationship where less wealthy states are able to maximize their redevelopment programs despite lower tax revenues. Furthermore, in removing the population variable, federal grants becomes positively significant. Lester and Lombard (1990: 312) noted a failure in the environmental protection literature to consider "federal-level variables affect state politics and policy in the environmental area." My model is able to account for this relationship and suggests that there is a

relationship between states that receive higher levels of funding from the federal government and more staff for brownfield redevelopment programs.

Staff/100,000 population yielded similar results to the staffing variable. In this model, size of state fund is still positive and significant. Therefore, in evaluating staff per capita, fund still plays a role. Tax revenues variable remains negative and significant, again indicating that states with smaller resources are dedicating relatively higher levels of staff to their program. Additionally, pollution severity, operationalized by the NPL sites variable is positive and significant. This suggests that states with more NPL sites and a higher pollution severity level are more likely to employ more staff/100,000 population. This is consistent with Bacot and Dawes' (1997: 360) findings, "population and pollution are overriding factors paramount to understanding state's environmental plights." Furthermore, my models propose that pollution severity is a major influence of staffing levels and staff/100,000 population; however population, tax revenues, and also funding (state fund and also federal funding) are intervening variables which also affect a state's propensity to staff brownfield redevelopment programs.

Shortcomings and Errors

My first two models, making use of sites completed as the dependent variables did not identify in any significant variables. This could be attributed to the lack of consistency between states on how to define a "clean-up." For example, both New Jersey (3,500 completed sites) and Massachusetts (2,800 completed sites) could possibly be including certain sites that other states may not include in their reports. (Note, the ELI does acknowledge variation among states.)

Hula (2001) found EPA region influences state adoption of redevelopment policies and initiatives. However, the EPA region variable is not significant in any of my models. This poses many questions. Hula (2001) discusses policy diffusion, suggesting that as states create programming, neighboring states, sharing similar characteristics, will also adopt these initiatives. Analysis of environmental redevelopment at the regional level suggests that there are policies that vary from region to region. There are also cultural or geographic differences that could impact state environmental policy and initiatives. Though the dependent variables in my models are not significantly associated with EPA region, there are other variables, including the structure of state environmental organization and political agenda setting that may impact regional level environmental programs (Bacot & Dawes, 1997).

Conclusion

This analysis of state characteristics related the adoption of brownfield redevelopment programs identified four significant findings:

1. Use of sites completed (clean-ups) and sites completed/NPL sites are not a significant indicator of state success relative to population EPA region, fiscal revenues/expenditures, and pollution severity.
2. State population and the size of state funds allocated to brownfield redevelopment are positive and significantly related to levels of staff that each state allots to run their environmental programming. Furthermore, tax

revenues (negative) and federal funding (positive) also play a significant role in state staffing levels.

3. State fund and pollution severity (NPL sites) are positive and significantly related to state staffing levels per 100,000 population. Additionally, the tax revenues variable is negatively significant, raising a question regarding the staffing levels of state's with smaller fiscal resources.
4. Pollution severity is a major indicator of state staffing levels and staff/population, while population, revenues, and fund serve as intervening variables.

These findings argue that state population, revenues (state taxes), funding (state and federal), and pollution severity are associated with state effort and investment in brownfield redevelopment. In evaluating state brownfield redevelopment policies and initiatives, it is essential to take these variables into account.

Appendix A
Correlation between Staff and Staff/Population (100,000)

		STAFFING	STAFFPOP
STAFFING	Pearson Correlation	1	.793(**)
	Sig. (2-tailed)	.	.000
	N	52	47
STAFFPOP	Pearson Correlation	.793(**)	1
	Sig. (2-tailed)	.000	.
	N	47	47

** Correlation is significant at the 0.01 level (2-tailed).

Appendix B
Correlation between Federal Grants, State Fund, and Tax Revenues

		FEDGRANT	FUND	TAXREVEN
FEDGRANT	Pearson Correlation	1	.186	.374(**)
	Sig. (2-tailed)	.	.187	.006
	N	52	52	52
FUND	Pearson Correlation	.186	1	.125
	Sig. (2-tailed)	.187	.	.376
	N	52	52	52
TAXREVEN	Pearson Correlation	.374(**)	.125	1
	Sig. (2-tailed)	.006	.376	.
	N	52	52	52

** Correlation is significant at the 0.01 level (2-tailed).

Appendix C				
Regression Summary				
Variable	**Model 1: Completed Sites as Dependent Variable**	**Model 2: Clean-Ups/NPL Sites as Dependent Variable**	**Model 3a: Staff as Dependent Variable**	**Model 3b: Staff/Population as Dependent Variable**
Population	-4.301 E-06 (0.000)	-1.000 E-006 (0.000)	6.402 E-06* (0.000)	--
EPA Region	-35.296 (88.111)	-6.029 (6.143)	1.758 (3.236)	-0.168 (0.131)
Federal Grants	0.000 (0.000)	1.450 E-005 (0.000)	1.940 E-05 (0.000)	-2.724 E-07 (0.000)
Clean-Up Fund	3.753 E-07 (0.000)	7.640 E-008 (0.000)	1.379 E-06*** (0.000)	4.490 E-08*** (0.000
Tax Revenues	9.243 E-06 (0.000)	1.690 E-006 (0.000)	-3.081 E-06 (0.000)	-9.503 E-08* (0.000)
NPL Sites	-2.811 (10.238)	--	0.028 (0.421)	0.041* (0.019)

***Indicates significance at the 0.001 level, **at the 0.01 level, and *at the 0.05 level

Coefficient (Standard Error)

Appendix D			
Regression Summary			
Variable	**Model 3a, without Population**	**Model 3a, without Clean-up Fund**	
Population	--	1.380 E-05** (0.000)	
EPA Region	5.261 (3.120)	-4.511 (4.854)	
Federal Grants	2.528 E-05* (0.000)	2.090 E-05 (0.000)	
Clean-Up Fund	1.592 E-06* (0.000)	--	
Tax Revenues	1.314 E-06 (0.000)	-7.402 E-06* (0.000)	
NPL Sites	-0.197 (0.445)	0.713 (0.494)	

***Indicates significance at the 0.001 level, **at the 0.01 level, and *at the 0.05 level

Coefficient (Standard Error)

Footnotes

1. Insert Appendix A.

2. Insert Appendix B.

3. Insert Appendix C.

4. While regression summaries include using unstandardized coefficients, regression equations use standardized coefficients

5. Insert Appendix D.

6. Regressions were also conducted without two major outliers (New Jersey and Massachusetts); however there was no effect on significance.

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